Complete Summary

GUIDELINE TITLE

Diagnosis and initial treatment of ischemic stroke.

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Diagnosis and initial treatment of ischemic stroke. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2003 Oct. 65 p. [113 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

- Ischemic stroke
- Transient ischemic attack (TIA)

GUIDELINE CATEGORY

Diagnosis
Evaluation
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Internal Medicine
Neurology

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Emergency Medical Technicians/Paramedics
Health Care Providers
Health Plans
Hospitals
Managed Care Organizations
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To increase the percentage of patients presenting within 3 hours of stroke onset and who are evaluated within 10 minutes of arriving in the emergency department (ED)
- To increase the percentage of patients receiving appropriate thrombolytic and antithrombotic therapy for ischemic stroke (use of tissue plasminogen activator [tPA] and aspirin [ASA])
- To increase the percentage of non-tPA recipient candidates with ischemic stroke who have hypertension appropriately managed in the first 48 hours of hospitalization or until neurologically stable
- To increase the percentage of patients with ischemic stroke who receive appropriate medical management for prevention of complications within the initial 24 to 48 hours of diagnosis
- To improve patient and family education of patients with ischemic stroke in both the emergency department and the admitting hospital unit

TARGET POPULATION

Patients age 18 years or older with symptoms suggestive of acute ischemic stroke or transient ischemic attack (TIA)

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis/Evaluation

1. Emergency department (ED) or clinic evaluation, as appropriate
2. History and physical examination, including neurologic examination (use of National Institutes of Health Stroke Scale) and establishing time of symptom onset
3. Screening for tissue plasminogen activator (tPA) treatment indications and contraindications
4. Diagnostic testing, such as laboratory testing (e.g., complete blood count, electrolytes, blood urea nitrogen, creatinine, glucose, prothrombin time, partial thromboplastin time, urine or serum pregnancy testing), electrocardiogram, computed tomography of the head without contrast, cardiac monitoring, oximetry
5. Other cardiac assessment (telemetry) as appropriate

Treatment

1. Education of patient/family regarding diagnosis, ED process, tests, treatment and risks
2. Blood pressure (BP) management
3. Measures to treat hyperthermia or hyperglycemia
4. Intravenous (IV) fluids (normal saline)
5. tPA
6. Aspirin (ASA) or other antithrombotics
7. Post ED management
    - Hospital care in intensive care unit or acute stroke unit/cardiac monitoring
    - Physical examinations, including vital signs and neurologic checks
    - BP management (monitoring and treating with easily titrated agents, such as labetalol, enalaprilat, enalapril)
    - Bleeding precautions
    - Monitoring for complications of therapy
    - Continued treatment of hyperthermia or hyperglycemia
    - Continued IV fluids
    - Deep vein thrombosis prophylaxis with low dose subcutaneous heparin, low-molecular-weight heparin (e.g., enoxaparin, dalteparin), or heparinoids (e.g., danaparoid); intermittent pneumatic compression
    - Swallow evaluation
    - Early rehabilitation

MAJOR OUTCOMES CONSIDERED

- Early stroke recurrence
- Stroke progression
- Mortality due to stroke
- Disability due to stroke

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Key conclusions (as determined by the work group) are supported by a conclusion grading worksheet that summarizes the important studies pertaining to the conclusion. Individual studies are classed according to the system presented below, and are designated as positive, negative, or neutral to reflect the study quality.

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results of different studies or because of serious doubts about generalizability, bias, design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Study Quality Designations

The quality of the primary research reports and systematic reviews are designated in the following ways on the conclusion grading worksheets:

Positive: indicates that the report or review has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis.

Negative: indicates that these issues (inclusion/exclusion, bias, generalizability, and data collection and analysis) have not been adequately addressed.

Neutral: indicates that the report or review is neither exceptionally strong nor exceptionally weak.

Not Applicable: indicates that the report is not a primary reference or a systematic review and therefore the quality has not been assessed.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Non-randomized trial with concurrent or historical controls
- Case-control study
- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Clinical Validation-Pilot Testing
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Institute Partners: System-Wide Review

The guideline annotation, discussion, and measurement specification documents undergo thorough review. Written comments are solicited from clinical, measurement, and management experts from within the member groups during an eight-week review period.

Each of the Institute's participating member groups determines its own process for distributing the guideline and obtaining feedback. Clinicians are asked to suggest modifications based on their understanding of the clinical literature coupled with their clinical expertise. Representatives from all departments involved in implementation and measurement review the guideline to determine its operational impact. Measurement specifications for selected measures are developed by the Institute for Clinical Systems Improvement (ICSI) in collaboration with participating member groups following implementation of the guideline. The specifications suggest approaches to operationalizing the measure.

Guideline Work Group

Following the completion of the review period, the guideline work group meets 1 to 2 times to review the input received. The original guideline is revised as necessary, and a written response is prepared to address each of the responses received from member groups. Two members of the Cardiovascular Steering Committee carefully review the input, the work group responses, and the revised draft of the guideline. They report to the entire committee their assessment of four questions: (1) Is there consensus among all ICSI member groups and hospitals on the content of the guideline document? (2) Has the drafting work group answered all criticisms reasonably from the member groups? (3) Within the knowledge of the appointed reviewer, is the evidence cited in the document current and not out-of-date? (4) Is the document sufficiently similar to the prior edition that a more thorough review (critical review) is not needed by the member

group? The committee then either approves the guideline for release as submitted or negotiates changes with the work group representative present at the meeting.

Pilot Test

Member groups may introduce the guideline at pilot sites, providing training to the clinical staff and incorporating it into the organization's scheduling, computer, and other practice systems. Evaluation and assessment occur throughout the pilot test phase, which usually lasts for three to six months. At the end of the pilot test phase, ICSI staff and the leader of the work group conduct an interview with the member groups participating in the pilot test phase to review their experience and gather comments, suggestions, and implementation tools.

The guideline work group meets to review the pilot sites' experiences and makes the necessary revisions to the guideline, and the Cardiovascular Steering Committee reviews the revised guideline and approves it for release.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The recommendations for the diagnosis and initial treatment of ischemic stroke are presented in the form of algorithms with 39 components, accompanied by detailed annotations. Algorithms are provided for: Screening (Ambulatory), Emergency Department, Stroke Code, Ischemic Stroke Emergency Department Management (not a thrombolysis candidate); clinical highlights and selected annotations (numbered to correspond with the algorithm) follow.

Class of evidence (A-D, M, R, X) and conclusion grade (I-III, Not Assignable) definitions are repeated at the end of the "Major Recommendations" field.

Clinical Highlights

1. Patients presenting within 3 hours of stroke onset should be evaluated by a physician within 10 minutes and receive a computed tomography (CT) scan within 25 minutes of arrival in the emergency department (ED). (Annotations #20, 25)
2. Intravenous (IV) tissue plasminogen activator (tPA) should be administered within 3 hours of stroke onset and less than 60 minutes of arrival at the ED. (Annotations #20, 21, 23, 25, 26; for Annotation #23 refer to the original guideline document)
3. Patients presenting with stroke onset who are not candidates for IV tPA should promptly be given aspirin (ASA). (Annotation #30)
4. Education regarding early stroke symptoms, diagnostic procedures, and treatment options should be offered to the patient and family. This should be documented in the patient chart. (Annotation #27)
5. Prevention of complications for medical management within the initial 24 to 48 hours of Diagnosis and Initial Treatment of Ischemic Stroke include continuing to treat hyperthermia or hyperglycemia, continuing IV fluids, initiating deep vein thrombosis prophylaxis, performing swallow evaluation, and initiating early rehabilitation. (Annotation #33)

Screening (Ambulatory) Algorithm Annotations

2. Immediate Brief Screening History for Ischemic Stroke

   This history should include detail as to the location, severity, duration of symptoms, and any aggravating or relieving factors. Symptoms that are commonly associated with ischemic stroke or transient ischemic attack (TIA) diagnoses include:*

   a. Sudden numbness or weakness of the face, arm, or leg--especially on one side of the body
   b. Sudden mental confusion, trouble speaking or understanding
   c. Sudden trouble walking, dizziness, loss of balance or coordination
   d. Sudden trouble seeing in one or both eyes
   e. Sudden severe headache with no known cause

   * List from American Stroke Association for public education

   Less common symptoms that may represent ischemic stroke or TIA include sudden onset vertigo, double vision, nausea or vomiting, stupor or coma, difficulty swallowing, a hoarse voice, and/or shaking of a limb.

3. Symptoms Consistent with New Ischemic Stroke, TIA or Unsure?

   Clinical diagnoses with neurologic symptoms that may imitate or superficially resemble ischemic stroke or TIA include migraine; epilepsy; syncope; transient global amnesia; peripheral nerve disorders; intracranial tumor, abscess, subdural hematoma, or other mass lesion; neuroses; and metabolic disorders. Refer to the original guideline document for further discussion of these clinical diagnoses.

   If there is any uncertainty as to symptom causation, the evaluation should proceed as though ischemic stroke or TIA is confirmed so as not to delay appropriate emergency treatment if needed.

6. Possible Cerebral Infarct, Symptoms Onset Within 24 Hours?

   The onset of symptoms should be defined as the last time the patient was known to be normal or at their previous prestroke baseline. If the symptoms resolve completely and then reoccur, for the purposes of determining whether thrombolysis can be considered for stroke, the time of onset would be the last time the patient was normal (just prior to the onset of the second set of symptoms). The patient may be unable to give this information if they have an aphasia or mental confusion. Family members or other witnesses may need to give this information. If the patient was sleeping and awoke with the problem, the time of onset would be the moment the patient was last known to be normal just before falling asleep.

7. Possible Cerebral Infarct, Symptoms Mild and Stable?

If the symptoms are mild (isolated dysarthria or numbness only) and have been present for more than 24 hours and are not increasing in severity or changing in character, it may be appropriate to avoid activation of 911 services for transport to the ED. Patients should not drive themselves to the hospital since the potential for deterioration may still exist.

10. Possible TIA, Symptoms Occurred Within Last 2 Hours?

    Patients with neurologic symptoms of stroke may not be fully aware of their condition due to the nature of this disease. If patients with suspected TIAs by history do have continuing neurologic deficits that they are unaware of, at this point in the evaluation they may still be a candidate for thrombolytic treatment. This group should therefore be triaged in the same fashion as those patients with active stroke symptoms so that the opportunity for administration of thrombolytic treatment is not missed when appropriate.

    Evidence supporting this recommendation is of classes: B, C, D, M, R

11. Possible TIA, or Symptoms Occurred >2 Hours, but Within Last 24 Hours?

    Patients may not require activation of 911 and may transport to the hospital for ED evaluation by other means. Patients should be instructed not to drive themselves to the hospital given the potential risk for recurrent symptoms that may put the patients and others at risk.

    Evidence supporting this recommendation is of classes: B, C, D, M, R

12. May Transport to Emergency Department by 911 or Other Means

    Patients should be taken to the ED urgently. If the deficit is mild and has been stable over time, or the symptoms have resolved, it might be reasonable to have a family member transport to the ED. Patients should not drive themselves to the hospital.

13. Possible TIA, or Symptoms Occurred >24 Hours, but Within Last 2 Weeks?

    Patients with a single episode of transient ischemic symptoms greater than 24 hours from presentation but within the last 2 weeks should be considered for an expedited outpatient evaluation (within 72 hours). Those patients with several TIAs within a short time frame (e.g. >4 TIAs in 2 weeks) may be at increased risk requiring more immediate evaluation and hospitalization. Also, specific diagnostic entities may require hospitalization despite the later presentation due to treatment needs (see discussion in the original guideline document).

    Evidence supporting this recommendation is of classes: B, C, D, M, R

14. Crescendo TIAs Within Last 2 Weeks, or Other Factors Suggesting High Risk for Immediate Future Events?

Crescendo TIA is defined as recurrent episodes of transient ischemic symptoms over a relatively short period, such as days to a few weeks. Other factors that may confer greater risk for imminent ischemic stroke in patients with TIA include a history of hypertension, myocardial infarction, cardiac arrhythmia, diabetes mellitus, known cardiac source of embolus, known hypercoagulable state, known underlying craniocervical arterial stenosis, sickle cell anemia, or cigarette smoking.

Evidence supporting this recommendation is of classes: B, C, D, M, R

15. Should be Seen in Clinic Within 72 Hours

Patients with a single episode of transient ischemic symptoms greater than 24 hours from the time of their reporting and within 2 weeks may not require immediate hospitalization but do need to be evaluated by a physician promptly. The designation of a 72-hour time frame is a reasonable guideline.

Evidence supporting this recommendation is of class: R

16. For Symptoms Occurring > 2 Weeks Ago, Clinic Appointment Within One Week

Risk of recurrence in this group may be lower than those with early presentation. Prompt outpatient evaluation by a physician within one week is appropriate.

Evidence supporting this recommendation is of classes: B, C, D, M, R

Emergency Department Treatment Algorithm Annotations

20. Symptom Onset Allows for Evaluation and Treatment Within 180 Minutes (with Thrombolysis IV)?

Patients presenting to the ED in an early time window (less than 150 minutes) may be candidates for treatment with IV tissue plasminogen activator (tPA) and will therefore require a rapid evaluation approach in order to initiate treatment as quickly as possible. Although the time window from onset of symptoms to treatment can be up to 180 minutes, the evaluation in the ED will require at least 30 minutes in most cases (CT scan of head, laboratory tests performed and results returned, IV access obtained, and neurological exam and history). The guideline committee has therefore chosen 150 minutes as a practical cut off time for this triage decision. Those who are not candidates for thrombolytic therapy could be evaluated according to usual ED routine. However there are important exceptions to use of this limited time restriction for triage of the patients into the "Stroke Code" process.

First, in certain instances, the time for evaluation may be shorter and this time limit of 150 minutes for triage to "Stroke Code" evaluation may be too conservative and should be 165 or 170 minutes. One example would be the patient who is already in the hospital and has received the appropriate laboratory evaluation, who already has an IV access, and for whom much of

the history is already known. In that case, a brief neurologic exam and rapid evaluation with CT may be the only items required prior to treatment and could theoretically be performed in 10 to 15 minutes.

Evidence supporting this recommendation is of classes: A, C, D, R, X

21. Intra-Arterial Thrombolytic Candidate? (Option Available?)

Intra-arterial thrombolytic therapy may be a treatment option for selected patients presenting in an early time frame but beyond the 3-hour time window for intravenous tPA. This is not a routine treatment. The availability of this option will be institution dependent. If considering this treatment option for a patient, physicians must explain to patients and family that this is an experimental treatment with substantial risk. Despite the limitations of available study data, in cases of more severe presentation with middle cerebral artery (MCA) or basilar occlusion, intra-arterial thrombolytic treatment may be appropriate since the prognosis without treatment is poor (see discussion in the original guideline document).

If the patient is an appropriate candidate for this treatment, consideration should be given to immediate transfer to an institution offering this intervention. If a radiologic interventionist skilled in this technique is available to the hospital, this person should be mobilized quickly.

See the original guideline document for criteria for consideration of angiographic evaluation for intra-arterial treatment.

Please note that the management during and following intra-arterial treatment is outside the scope of this guideline.

Evidence supporting this recommendation is of classes: A, C, D

Stroke Code Algorithm Annotations

25. Stroke Code

The guideline committee uses the term "stroke code" to refer to a process in the ED for the rapid evaluation and treatment of patients who have presented in a time frame qualifying them for thrombolytic therapy. This process may take many forms. It might include a formal "stroke team" that is called whenever a possible candidate for tPA has presented or it may include the ED staff who have been trained in the rapid evaluation and treatment of stroke victims. The general concept is one which includes:

1. Rapid triage of patients as soon as they arrive in the ED
2. Immediate initiation of phlebotomy for appropriate blood tests followed by CT scan
3. First physician contact for history and exam occurring early in the ED visit. The National Institutes of Health (NIH) recommendation for timing of door to "first physician contact" for thrombolytic candidates is within 10 minutes.

4. Rapid access to the best neurologic and radiologic expertise available at the individual institution for evaluation of the patient and the CT scan prior to treatment. This may include a neurologist and neuroradiologist present at the time of treatment. Alternatively, it may be a primary care physician (PCP) with expertise in stroke diagnosis and administration of tPA and a general radiologist with expertise in reviewing head CT scans for early infarct change. The NIH recommendation for the timing of "door to initiation of CT scan" for thrombolytic candidates is within 25 minutes.
5. The goal of the stroke code should be to rapidly administer tPA in appropriately screened candidates. The NIH recommendation for the timing of "door to drug" for thrombolytic treatment is within 60 minutes.

26. Evaluation (Should Occur Concurrently with Intervention)
    A. Review History and Tissue Plasminogen Activator Treatment Indications and Contraindications

       Take a complete patient history including a review of indications and contraindications for treatment with tPA. The contraindications for treatment should be considered relative contraindications. There may be instances in which treatment outside these guidelines may be appropriate in the clinical judgment of the treating physician. It should be noted, however, that community studies have shown an increase in hemorrhagic complications in those treated outside the National Institutes of Neurological Disorders and Stroke (NINDS) study protocol.

       1. Indications for tPA
          a. Acute onset of focal neurologic symptoms in a defined vascular territory, consistent with ischemic stroke
          b. Clearly defined onset of stroke less than 3 hours prior to planned start of treatment; if the patient awakens with symptoms, onset is defined as the time of the last known baseline neurological status
          c. 18 years of age or older
          d. CT scan does not show evidence of intracranial hemorrhage, sulcal edema, hemispheric swelling, or large areas of low attenuation consistent with acute stroke
       2. Contraindications for tPA

          Clinical Contraindications

          a. Clearly defined onset of stroke greater than 3 hours prior to planned start of treatment; if the patient awakens with symptoms, onset is defined as the time of the last known baseline neurological status
          b. Rapidly improving symptoms
          c. Mild stroke symptoms/signs

          Examples include:

- Sensory symptoms only
- Ataxia without other deficits
- Dysarthria without other deficit
- Mild motor signs (non-disabling)
- Visual field defect without other deficit

d. In the setting of middle cerebral artery (MCA) stroke, an obtunded or comatose state may be a relative contraindication.
e. Seizure at onset of stroke symptoms or within the 3 hours prior to tPA administration
f. Clinical presentation suggestive of subarachnoid hemorrhage regardless of CT result
g. Hypertension--systolic blood pressure (SBP) greater than 185 mm Hg or diastolic blood pressure (DBP) greater than 110 mm Hg

   Patients with this blood pressure (BP) excluded only if it remains elevated on consecutive measurements. Also exclude if aggressive treatment is required to lower BP into appropriate range (e.g., if more than a few doses of any medication is required or if nitroprusside drip is required).

h. Age less than 18 years

History Contraindications

a. Minor ischemic stroke within the last month
b. Major ischemic stroke or head trauma within the last 3 months
c. History of intracerebral or subarachnoid hemorrhage if recurrence risk is substantial
d. Untreated cerebral aneurysm, arteriovenous malformation (AVM), or brain tumor
e. Gastrointestinal or genitourinary hemorrhage within the last 21 days
f. Arterial puncture at a noncompressible site within the last 7 days or lumbar puncture within the last 3 days
g. Major surgery or major trauma within the last 14 days
h. Clinical presentation suggestive of acute myocardial infarction (MI) or post-MI pericarditis
i. Patient taking oral anticoagulants and international normalized ratio (INR) greater than 1.7
j. Patient receiving heparin within the last 48 hours and having an elevated activated partial thromboplastin time (aPTT)
k. Patient receiving low-molecular-weight heparin within the last 24 hours
l. Pregnant, or anticipated pregnant, female
m. Known hereditary or acquired hemorrhagic diathesis or unsupported coagulation factor deficiency
n. Received tPA less than 7 days previously

Laboratory Contraindications

a. Glucose less than 50 or greater than 400 mg per deciliter
b. Platelet count less than 100,000 per cubic millimeter
c. Prothrombin time greater than 15 or INR greater than 1.7*
d. Elevated aPTT*

*Results of this test would be required prior to treatment if the patient is on warfarin or heparin or if liver disease is suspected.

e. Positive pregnancy test

Radiology Contraindications

a. Intracranial hemorrhage
b. Large area of low attenuation and/or effacement of cerebral sulci consistent with new or evolving stroke may be a relative contraindication.
c. Intracranial tumor, aneurysm, arteriovenous malformation (AVM) or other space-occupying lesion

B. Perform Neurologic Examination and Vital Signs Every 15 Minutes

A history and neurological examination must be performed to assess whether the presentation is consistent with a stroke diagnosis and to estimate the severity of the deficit. Use of the National Institutes of Health Stroke Scale (NIHSS) by physicians and nursing staff is encouraged as this would provide a uniform method of evaluation for comparison between examiners during the early hours of the stroke evaluation. The guideline committee encourages use of the NIHSS as an initial evaluation tool and after resuscitation or treatment to assess for change.

The NIHSS is a quantitative measure of neurologic deficit in stroke patients that covers the key aspects of the neurological exam including level of consciousness and orientation, eye movements, visual fields, facial weakness, motor strength in limbs, coordination, sensation, language and comprehension of language, articulation, and neglect. It can be performed in rapid fashion (5-8 minutes) which is an important feature in this clinical setting.

C. Estimated Weight
D. Draw Blood for Lab Tests

Recommended laboratory tests include complete blood count, electrolytes, blood urea nitrogen (BUN), creatinine, glucose, prothrombin time, and partial thromboplastin time. These tests are used to evaluate for dehydration, metabolic disorders which might

influence neurologic status (especially hypoglycemia and hyperglycemia), hematologic disorders such as polycythemia which may affect cerebral perfusion, or coagulopathies which could affect the treatment decision. Prior to administration of tPA the platelet count and glucose level should be reviewed. If the patient is known to be on warfarin or has received heparin within the last 24 hours, the prothrombin time and partial thromboplastin time should be reviewed prior to treatment. A urine or serum pregnancy test should be obtained in appropriate individuals.

E. Initiate Two Intravenous Lines

Two IV lines should be started so that tPA may have a dedicated line.

F. Perform Electrocardiogram

An electrocardiogram should be performed for the purpose of screening for concomitant cardiac disease, either acute or chronic which may impact on immediate treatment decisions.

G. Perform CT Head Without Contrast

A CT scan without contrast must be performed prior to treatment with tPA, primarily for the purpose of excluding hemorrhage. Early signs of infarct should also be sought, as this finding confers greater risk of symptomatic intracerebral hemorrhage with tPA treatment. It is suggested that the greatest level of radiologic expertise possible be obtained for this reading with the caveat that this CT reading should not create excessive delays in the evaluation and treatment process. A process for rapid teleradiography CT readings should be organized and in place if needed.

H. Other Cardiac Assessment as Appropriate (Telemetry)

Evidence supporting this recommendation is of classes: B, C, D, R

27. Intervention (Should Occur Concurrently with Evaluation)

A. Educate Patient and Family

A process should be in place for the patient and family that will rapidly orient them to the suspected diagnosis, ED process, tests to be performed, tPA treatment and its risks, and other treatment measures to be considered. This could include both caregiver face-to-face interaction with the patient and family as well as teaching tools in written form. Education should be documented in the medical record.

B. Treat Hypertension if >185/110

Recommendations for Management of BP in the Setting of Acute Stroke

Recommendations - Ischemic stroke, tPA candidate:

1. No tPA if DBP >140 on 2 readings, 5 min apart and use nitroprusside to control
2. Treat SBP >185 or DBP >110 using easily titrated agents (labetalol, enalaprilat)
3. Maintain SBP <185 and DBP <105 for the first 24 hours following treatment with tPA
4. Monitor BP and any corresponding neurologic changes in the ED and first few days of hospitalization. Avoid overtreating BP.

It is important to recognize that these recommendations must be tailored to the individual, dependent on their acute presentation and whether or not there is a previous history of hypertension. Young patients without a previous history of hypertension may be less tolerant of the higher extremes of BP in this setting. Specific comorbidities which may require a more aggressive use of antihypertensive therapy in this setting include:

1. Left ventricular failure
2. Aortic dissection
3. Acute myocardial ischemia
4. Renal insufficiency induced by accelerated hypertension
5. Hypertensive encephalopathy
6. Hemorrhagic conversion of an ischemic infarct
7. Thrombolytic treatment

In general, discontinuation of a patient's usual daily antihypertensive regimen is not advised as this may result in unwanted rebound hypertensive effects. Exceptions to this practice might include holding these medications if the BP is low and holding diuretic therapy regardless of the BP, to avoid any problems with volume depletion that might contribute to hemoconcentration that could limit blood flow.

C. Start IV Fluids

Treatment with a 0.9% normal saline at a rate of 75 to 125 cc/hr or 2-3 L/day should be administered for the avoidance of dehydration. The rate may be adjusted for febrile patients.

D. Treat Hyperthermia or Hyperglycemia

Hyperthermia

Interventions for patients with temperatures of greater than 37.5 degrees C (greater than 99.5 degrees F) include appropriate dosing of acetaminophen (10-15 mg/kg every 4 hours) and regular monitoring of temperature status (every 4 hours). For those patients with extreme hyperthermia greater than 39.4 degrees C (greater than 103 degrees F), aggressive interventions including cooling blankets and ice

packs are encouraged. Secondary causes for temperature elevation should be sought.

In human studies, early hyperthermia in acute stroke is associated with increased risk of poor outcome, higher mortality, and increased infarct volume. The causality and the relationship of temperature elevation to these poor outcomes are not fully understood. Whether intervention with cooling methods will result in improved outcomes is unknown. [Conclusion Grade III: See Discussion Appendix A, Conclusion Grading Worksheet - Annotation #27D (Hypertension) in the original guideline document]

Hyperglycemia

Hyperglycemia may adversely influence clinical outcome.

1. Early identification of patients with hyperglycemia in the setting of acute ischemic stroke or in those at risk for cerebral ischemia (ED evaluation of glucose level) is recommended.
2. Avoid any agents or factors which might induce hyperglycemia.
    - Eliminate glucose from any IV solutions used. (Recommend use of normal saline.)
    - Avoid use of corticosteroids, even in those patients with cerebral edema, as it is unlikely to be helpful and may be harmful. Separate recommendations are needed for those on maintenance corticosteroid dosing for concurrent conditions and treatment decisions are left to the clinical discretion of the physician.
3. Use appropriate measures to maintain euglycemia, carefully avoiding hypoglycemia.
4. Continue to monitor glucose with bedside testing in those receiving treatment in order to maintain euglycemia.

It is unclear whether early hyperglycemia in the setting of acute stroke may be a marker of physiologic stress or an independent predictor of poor outcome. Usual management of hyperglycemia with gentle dosing of subcutaneous insulin in a timely manner during acute ischemia would seem prudent until ongoing clinical trials address the appropriateness of more aggressive treatment measures. [Conclusion Grade III: See Discussion Appendix B, Conclusion Grading Worksheet - Annotation #27D (Hyperglycemia) in the original guideline document]

28. Patient Meets Criteria for tPA, Has No Contraindications and Symptom Onset Still Less Than 3 Hours?

    Refer to Algorithm Annotation #26, "Evaluation (Should Occur Concurrently With Intervention)," for criteria.

29. Initiate Tissue Plasminogen Activator (tPA)

Treatment should consist of tPA 0.9 mg/kg intravenously to a maximum dose of 90 mg. Ten percent of this dose should be given as a bolus over 1 to 2 minutes and the remainder infused over one hour. This dosing may be based upon actual or estimated weight.

30. Initiate Aspirin or Other Antithrombotics

    Aspirin (ASA)

    Patients who are not candidates for tPA should be promptly given ASA in a dose of 325 mg orally, rectally, or by nasogastric tube and should be continued in a similar daily dose. Exceptions to this approach would include avoiding treatment in those with contraindications to ASA therapy (e.g., ASA allergy, gastrointestinal hemorrhage).

    Considerations with Heparin Use

    Full-dose continuous infusion of unfractionated heparin should not be used indiscriminately for all patients presenting with ischemic stroke since effectiveness of the agent at this dose range was not shown in a large randomized controlled trial. Similarly, there is inadequate data to advocate for low-molecular-weight heparinoid agents in a full-dose regimen. There may be small subgroups of patients with specific pathophysiologic mechanisms or risks who would benefit (e.g., dissection, cardioembolism with high risk of recurrence such as those with echocardiographic evidence of thrombus), but these specific indications require further study.

    If a full-dose heparin regimen is to be used, the guideline committee suggests avoiding bolus dosing and administering a starting dose of 800 to 1200 units per hour with close monitoring to maintain the activated partial thromboplastin time (aPTT) between 1.5 to 2 times the baseline pretreatment level. If using these dosing regimens for patients with acute ischemic stroke, physicians are strongly recommended to describe to their patients the lack of proof for this therapy and to detail the potential hazards of therapy. If the CT scan or magnetic resonance imaging (MRI) scan on admission shows evidence of hemorrhagic stroke, no antiplatelet or anticoagulant should be given.

    The routine use of acute anticoagulation treatment with unfractionated heparin, low-molecular-weight heparin, or heparinoid in acute ischemic stroke is not supported by the available evidence. This treatment does not appear to improve clinical outcome from the index stroke. There may be subgroups who benefit, but further studies of this problem are required for confirmation. [Conclusion Grade I: See Discussion Appendix C, Conclusion Grading Worksheet - Annotation #30 (Heparin) in the original guideline document]

    Evidence supporting this recommendation is of classes: A, M, R

31. Post-Emergency Department Medical Management (Post-Thrombolysis)
    A. Admit to intensive care unit or acute stroke care unit/cardiac monitoring.

B. Perform vital signs and neurologic checks every 15 minutes for 2 hours, then every 30 minutes for 6 hours, then every 60 minutes for 24 hours (recommend use of an abbreviated National Institutes of Health Stroke Scale [NIHSS] for neurologic checks).
C. BP treatment parameters:
    1. First 24 hours: Treat if SBP greater than 185 or DBP greater than 110.
    2. 24-72 hours: Treat if SBP greater than 220, mean arterial pressure (MAP) greater than 130.
D. Institute bleeding precautions:
    1. Avoid placement of central venous access or arterial puncture for the first 24 hours.
    2. Placement of an indwelling bladder catheter should be avoided during drug infusion and for at least 30 minutes after infusion ends.
    3. Insertion of a nasogastric tube should be avoided, if possible, during the first 24 hours.
    4. Avoid use of anticoagulant, antiplatelet, or non-steroidal anti-inflammatory agents for the first 24 hours.
E. If any signs of central nervous system (CNS) hemorrhage (e.g., neurologic deterioration, development of severe headache, sudden severe elevation of BP, or new nausea or vomiting) or signs of major systemic hemorrhage institute the following measures:
    1. Discontinue ongoing infusion of thrombolytic drug.
    2. Obtain hemoglobin, hematocrit, partial thromboplastin time, prothrombin time/INR, platelet count, fibrinogen (also type and cross match if transfusions will be needed).
    3. Obtain surgical consultation if necessary.
    4. Obtain emergent CT head without contrast if central nervous system hemorrhage suspected.
F. Initiate other anti-thrombotic therapy 24 hours after tPA administration (antiplatelet agent or anticoagulant as appropriate).

32. Post-Emergency Department Medical Management (Not a Thrombolysis Candidate)

B. Treat BP if greater than 220/120 or MAP greater than 130

Recommendations for Management of BP in the Setting of Acute Stroke

Recommendations -Ischemic stroke, not a tPA candidate:

1. Treat BP only if SBP greater than 220, MAP greater than 130.
2. Use easily titrated agents, choosing those with the least effect on cerebrovasculature (labetalol, enalaprilat). American Heart Association (AHA) recommendations support oral dosing, but if swallowing is affected IV agents should be used.

    Note: Dosing examples are included in the original guideline document.

3. Avoid agents which tend to cause precipitous drops in BP (e.g., sublingual calcium channel blockers).

4. Treat hypotension (IV fluids, treat congestive heart failure or arrhythmia and consider pressors).
5. Monitor BP and any corresponding neurologic changes in the ED and first few days of hospitalization. Avoid overtreating BP.

Recommendations - Intracerebral hemorrhage

1. Treat BP only if SBP greater than 180, MAP greater than 130.
2. The goal of treatment should be to lower the BP to a MAP of 100 to 130 or to the lower hypertensive range (e.g., SBP of 140-160).

It is important to recognize that these recommendations must be tailored to the individual, dependent on their acute presentation and whether or not there is a previous history of hypertension. Young patients without a previous history of hypertension may be less tolerant of the higher extremes of BP in this setting. Specific comorbidities which may require a more aggressive use of antihypertensive therapy in this setting include:

1. Left ventricular failure
2. Aortic dissection
3. Acute myocardial ischemia
4. Renal insufficiency induced by accelerated hypertension
5. Hypertensive encephalopathy
6. Hemorrhagic conversion of an ischemic infarct
7. Thrombolytic treatment

In general, discontinuation of a patient's usual daily antihypertensive regimen is not advised as this may result in unwanted rebound hypertensive effects. Exceptions to this practice might include holding these medications if the BP is low and holding diuretic therapy regardless of the BP, to avoid any problems with volume depletion that might contribute to hemoconcentration that could limit blood flow.

33. Other Post-Emergency Department Medical Management (First 24-48 Hours)

A. Continue to treat hyperthermia or hyperglycemia

Refer to Annotation #27D, "Treat Hyperthermia or Hyperglycemia", above.

C. Initiate deep vein thrombosis prophylaxis

Patients with acute ischemic stroke with restricted mobility should be treated with prophylactic low dose subcutaneous heparin (5,000 Units every 12 hours is the standard dose; 5,000 Units every 8 hours has been used in larger individuals) or low- molecular-weight heparin (Enoxaparin 40 mg subcutaneously [SQ] four times a day [QD], Dalteparin 2,500 units SQ QD) or heparinoids (Danaparoid 750 anti Xa units SQ twice a day [BID]). If there is a contraindication to

anticoagulation, intermittent pneumatic compression devices are an alternative treatment option.

D. Perform swallow evaluation

Early evaluation of swallow should be performed in patients at risk of aspiration so that an appropriate diet adjustment may be instituted. Patients at risk include those with facial weakness, significant dysarthria, excessive drooling, sputtering, choking, gurgling, wet voice, or pocketing food in mouth. Clear liquids by mouth and in some cases any food or fluid should be avoided in this setting until a swallow evaluation has established the patient's level of risk for aspiration with the various consistencies.

E. Initiate rehabilitation early

Early mobilization within 48 hours of admission is advocated by means of early initiation of appropriate rehabilitation swivels or other nursing intervention for the purpose of preventing complications related to immobility including deep vein thrombosis, contractures, joint disorders, and pressure sores/decubitus ulcers.

Evidence supporting this recommendation is of classes: M, R

Ischemic Stroke Emergency Department Management Algorithm Annotations

37. Patient Requires Hospital Admission?

Patients with acute ischemic stroke or TIA (occurring less than 24 to 48 hours before presentation) should generally be admitted to the hospital unless it is clearly based on expert opinion that outpatient evaluation and treatment is appropriate.

In patients with ischemic stroke occurring days to weeks prior to initial clinical evaluation with stable neurologic deficits, admission to the hospital is not always required. However, the following comorbidities or complications should be considered as possible reasons for admission to the hospital.

1. Significant impairment of activities of daily living that render return to home unsafe
2. Suspected medical complications of stroke such as aspiration pneumonia, deep vein thrombosis, cardiac dysrhythmia, urinary tract infection, dehydration, rhabdomyolysis or other problems requiring medical intervention
3. Other medical comorbidities such as uncontrolled diabetes, uncontrolled hypertension or unstable ischemic cardiac disease or dysrhythmia
4. Cause for stroke unclear and hospital admission necessary to expedite evaluation for causation

5. Inadequate anticoagulation in patients with atrial fibrillation, valvular disorders, patent foramen ovale or vascular disease.

Evidence supporting this recommendation is of classes: B, C, D, M, R

Definitions:

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results from different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Non-randomized trial with concurrent or historical controls
- Case-control study

- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

CLINICAL ALGORITHM(S)

Detailed and annotated clinical algorithms are provided for:

- Screening (Ambulatory)
- Emergency Department Treatment
- Stroke Code
- Ischemic Stroke Emergency Department Management (not a thrombolysis candidate)

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The guideline contains an annotated bibliography and discussion of the evidence supporting each recommendation. The type of supporting evidence is classified for selected recommendations (see "Major Recommendations").

In addition, key conclusions contained in the Work Group's algorithm are supported by a grading worksheet that summarizes the important studies pertaining to the conclusion. The type and quality of the evidence supporting these key recommendations (i.e., choice among alternative therapeutic approaches) is graded for each study.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Appropriate screening and referral for patients presenting with neurological symptoms
- Rapid evaluation and treatment of patients who are candidates for thrombolytic therapy
- Improved management of ischemic stroke
- Effective prevention of stroke progression/recurrence
- Decreased mortality and morbidity associated with ischemic stroke

POTENTIAL HARMS

Adverse effects of thrombolytic drugs can include signs of central nervous system hemorrhage (e.g., neurologic deterioration, development of severe headache, sudden severe elevation of blood pressure, or new nausea or vomiting) or signs of major systemic hemorrhage.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications for Tissue Plasminogen Activator (tPA)

Clinical Contraindications

- Clearly defined onset of stroke greater than 3 hours prior to planned start of treatment; if the patient awakens with symptoms, onset is defined as the time of the last known baseline neurological status
- Rapidly improving symptoms
- Mild stroke symptoms/signs. Examples include: sensory symptoms only, ataxia without other deficits, dysarthria without other deficit, mild motor signs (non-disabling), and visual field defect without other deficit
- In the setting of middle cerebral artery stroke, an obtunded or comatose state may be a relative contraindication.
- Seizure at onset of stroke symptoms or within the 3 hours prior to tPA administration
- Clinical presentation suggestive of subarachnoid hemorrhage regardless of computed tomography result
- Hypertension--systolic blood pressure (SBP) greater than 185 mm Hg or diastolic blood pressure (DBP) greater than 110 mm Hg. Patients with this blood pressure (BP) excluded only if it remains elevated on consecutive measurements. Also exclude if aggressive treatment is required to lower blood pressure into appropriate range (e.g., if more than a few doses of any medication is required or if nitroprusside drip is required).
- Age less than 18 years

History Contraindications

- Minor ischemic stroke within the last month
- Major ischemic stroke or head trauma within the last 3 months
- History of intracerebral or subarachnoid hemorrhage if recurrence risk is substantial
- Untreated cerebral aneurysm, arteriovenous malformation (AVM), or brain tumor
- Gastrointestinal or genitourinary hemorrhage within the last 21 days
- Arterial puncture at a noncompressible site within the last 7 days or lumbar puncture within the last 3 days
- Major surgery or major trauma within the last 14 days
- Clinical presentation suggestive of acute myocardial infarction (MI) or post-myocardial infarction pericarditis
- Patient taking oral anticoagulants and international normalized ratio (INR) greater than 1.7
- Patient receiving heparin within the last 48 hours and having an elevated activated partial thromboplastin time
- Patient receiving low-molecular-weight heparin within the last 24 hours
- Pregnant, or anticipated pregnant, female
- Known hereditary or acquired hemorrhagic diathesis or unsupported coagulation factor deficiency
- Received tPA less than 7 days previously

Laboratory Contraindications

- Glucose less than 50 or greater than 400 mg per deciliter
- Platelet count less than 100,000 per cubic millimeter
- Prothrombin time greater than 15 or INR greater than 1.7*
- Elevated activated partial thromboplastin time (aPTT)*

  *Results of this test would be required prior to treatment if the patient is on warfarin or heparin or if liver disease is suspected.

- Positive pregnancy test

Radiology Contraindications

- Intracranial hemorrhage
- Large area of low attenuation and/or effacement of cerebral sulci consistent with new or evolving stroke may be a relative contraindication.
- Intracranial tumor, aneurysm, arteriovenous malformation (AVM) or other space-occupying lesion

Contraindications to Aspirin (ASA) Therapy

- Aspirin allergy
- Gastrointestinal hemorrhage

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These clinical guidelines are designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and are not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. A guideline will rarely establish the only approach to a problem.
- This clinical guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients are urged to consult a health care professional regarding their own situation and any specific medical questions they may have.
- Hyperthermia. In human studies, early hyperthermia in acute stroke is associated with increased risk of poor outcome, high mortality, and increased infarct volume. The causality and the relationship of temperature elevation to these poor outcomes is not fully understood. Whether intervention with cooling methods will result in improved outcomes is unknown.
- Hyperglycemia. It is unclear whether early hyperglycemia in the setting of acute stroke may be a marker of physiologic stress or an independent predictor of poor outcome. Usual management of hyperglycemia with gentle dosing of subcutaneous insulin in a timely manner during acute ischemia would seem prudent until ongoing clinical trials address the appropriateness of more aggressive treatment measures.
- Heparin. The routine use of acute anticoagulation treatment with unfractionated heparin or low-molecular-weight heparin in acute ischemic stroke is not supported by the available evidence. This treatment does not appear to prevent early stroke recurrence or stroke progression, or improve clinical outcome from the index stroke. There may be a subgroup of patients with large vessel thrombotic occlusion who may benefit, but further studies of this problem are required for confirmation.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Once a guideline is approved for release, a member group can choose to concentrate on the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment, and tobacco cessation.

The following aims were identified by the guideline work group as key areas in which medical groups may receive benefits in implementing this guideline.

Priority Aims and Suggested Measures for Health Care Settings

1. Increase the percentage of patients presenting within 3 hours of stroke onset and who are evaluated within 10 minutes of arriving in the emergency department (ED).

   Possible measure for accomplishing this aim:

   a. Percentage of patients presenting within 3 hours of stroke onset who are evaluated with 10 minutes of arriving in the ED.
2. Increase the percentage of patients receiving appropriate thrombolytic and antithrombotic therapy for ischemic stroke (use of tissue plasminogen activator [tPA] and aspirin [ASA]).

   Possible measures for accomplishing this aim:

   a. Percentage of patients presenting with ischemic stroke treated with the more effective therapy, tPA.
   b. Percentage of patients who are not candidates for tPA treatment who receive ASA within 24 hours of symptom onset.
   c. Percentage of patients receiving tPA who are treated despite contraindications to treatment (i.e., treated beyond 3 hours, treated despite uncontrolled hypertension and other contraindications predisposing to intracranial or systemic bleeding).
   d. Percentage of patients who are candidates for tPA:
      - with a "door to drug" time (time of arrival to time of drug administration) of less than 60 minutes.
      - who receive a computed tomography (CT) scan within 25 minutes of arrival in the ED.
3. Increase the percentage of non-tPA recipient candidates with ischemic stroke who have hypertension appropriately managed in the first 48 hours of hospitalization or until neurologically stable.

   Possible measures for accomplishing this aim:

   a. Percentage of patients with ischemic stroke who are hypertensive at presentation (systolic blood pressure [SBP] greater than 140 but less than or equal to 220 OR diastolic blood pressure [DBP] greater than 90 but less than or equal to 120) in whom "as needed" antihypertensive treatment to lower blood pressure (BP) is avoided in the first 48 hours of hospitalization.
4. Increase the percentage of patients with ischemic stroke who receive appropriate medical management for prevention of complications within the initial 24-48 hours of diagnosis including:
   - continuing to treat hyperthermia or hyperglycemia
   - continue intravenous fluids
   - initiate deep vein thrombosis prophylaxis
   - perform swallow evaluation
   - initiate early rehabilitation (early mobilization)

   Possible measures for accomplishing this aim:

   a. Percentage of patients with ischemic stroke who receive appropriate intervention for hyperthermia and hyperglycemia.

b. Percentage of patients with ischemic stroke who receive intravenous fluids.
c. Percentage of patients with ischemic stroke with paralysis or other reason for immobility receiving appropriate prevention for venous thromboembolism (subcutaneous heparin or pneumatic compression device).
d. Percentage of patients with ischemic stroke who are at risk for aspiration who receive an early swallow evaluation.
e. Percentage of patients with ischemic stroke mobilized from bed within 48 hours of admission.

5. Improve patient and family education of patients with ischemic stroke in both the ED and the admitting hospital unit.

   Possible measures for accomplishing this aim:

   a. Percentage of patients presenting in the ED with ischemic stroke onset for whom patient/family education is documented in the medical record.
   b. Percentage of patients admitted to a hospital unit with ischemic stroke for whom patient/family education has been documented in the medical record.
   c. Percentage of patients/family members presenting in the ED with ischemic stroke onset who report having a discussion with a member of the ED healthcare team in which they were oriented to acute stroke, as recommended by the guideline.

At this point in development for this guideline, there are no specifications written for possible measures listed above. The Institute for Clinical Systems Improvement will seek input from the medical groups on what measures are of most use as they implement the guideline. In a future revision of the guideline, one or two measurement specifications may be included.

Systems Approaches to Implementation for this Guideline

1. Hospitals should consider developing and implementing critical pathways, standing orders and a stroke process to accomplish rapid evaluation and treatment.
   a. Established process for expediting the evaluation and treatment of patients who are candidates for intravenous (IV) tPA
   b. Presence of standing orders for acute stroke to include:
      - Ongoing antithrombotic therapy
      - Management of blood pressure
      - Early mobilization
      - Use of appropriate anti-embolism treatment in the paralyzed patient
2. A process should be in place for the patient and family that will rapidly orient them to the suspected diagnosis, ED process, tests to be performed, tPA treatment and its risks, and other treatment measures to be considered. This could include both caregiver face-to-face interactions with the patient and family as well as teaching tools in written form.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Patient-centeredness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Diagnosis and initial treatment of ischemic stroke. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2003 Oct. 65 p. [113 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2001 Oct (revised 2003 Oct)

GUIDELINE DEVELOPER(S)

Institute for Clinical Systems Improvement - Private Nonprofit Organization

GUIDELINE DEVELOPER COMMENT

Organizations participating in the Institute for Clinical Systems Improvement (ICSI): Affiliated Community Medical Centers, Allina Medical Clinic, Altru Health System, Aspen Medical Group, Avera Health, CentraCare, Columbia Park Medical Group, Community-University Health Care Center, Dakota Clinic, ENT Specialty Care, Fairview Health Services, Family HealthServices Minnesota, Family Practice Medical Center, Gateway Family Health Clinic, Gillette Children's Specialty Healthcare, Grand Itasca Clinic and Hospital, HealthEast Care System, HealthPartners Central Minnesota Clinics, HealthPartners Medical Group and Clinics, Hutchinson Area Health Care, Hutchinson Medical Center, Lakeview Clinic, Mayo Clinic, Mercy Hospital and Health Care Center, MeritCare, Mille Lacs Health System, Minnesota Gastroenterology, Montevideo Clinic, North Clinic, North Memorial Care System, North Suburban Family Physicians, Northwest Family Physicians, Olmsted Medical Center, Park Nicollet Health Services, Pilot City Health Center, Quello Clinic, Ridgeview Medical Center, River Falls Medical Clinic, Saint Mary's/Duluth Clinic Health System, St. Paul Heart Clinic, Sioux Valley Hospitals

and Health System, Southside Community Health Services, Stillwater Medical Group, SuperiorHealth Medical Group, University of Minnesota Physicians, Winona Clinic, Ltd., Winona Health

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GUIDELINE COMMITTEE

Cardiovascular Steering Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

In the interest of full disclosure, ICSI has adopted a policy of revealing relationships work group members have with companies that sell products or services that are relevant to this guideline topic. The reader should not assume that these financial interests will have an adverse impact on the content of the guideline. Readers of the guideline may assume that only work group members listed below have potential conflict of interest to disclose.

No work group members have potential conflicts of interest to disclose.

ICSI's conflict of interest policy and procedures are available for review on ICSI's website at www.icsi.org.

GUIDELINE STATUS

This is the current release of the guideline.

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GUIDELINE AVAILABILITY

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Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Diagnosis and initial treatment of ischemic stroke. In: ICSI pocket guidelines. April 2003 edition. Bloomington (MN): Institute for Clinical Systems Improvement, 2003 Mar. p. 84-93.

Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

PATIENT RESOURCES

None available

NGC STATUS

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